COEN-352
Tutorial #10

April 02nd, 2023

INDEXING

- So far we have seen multiple ways to organize our data: Arrays, Binary Search Trees, Heaps,…etc.
- Some have a concept of position [index] and others are positioned relatively [linked].

Indexing: A data structure technique used to efficiently access data based on an key.

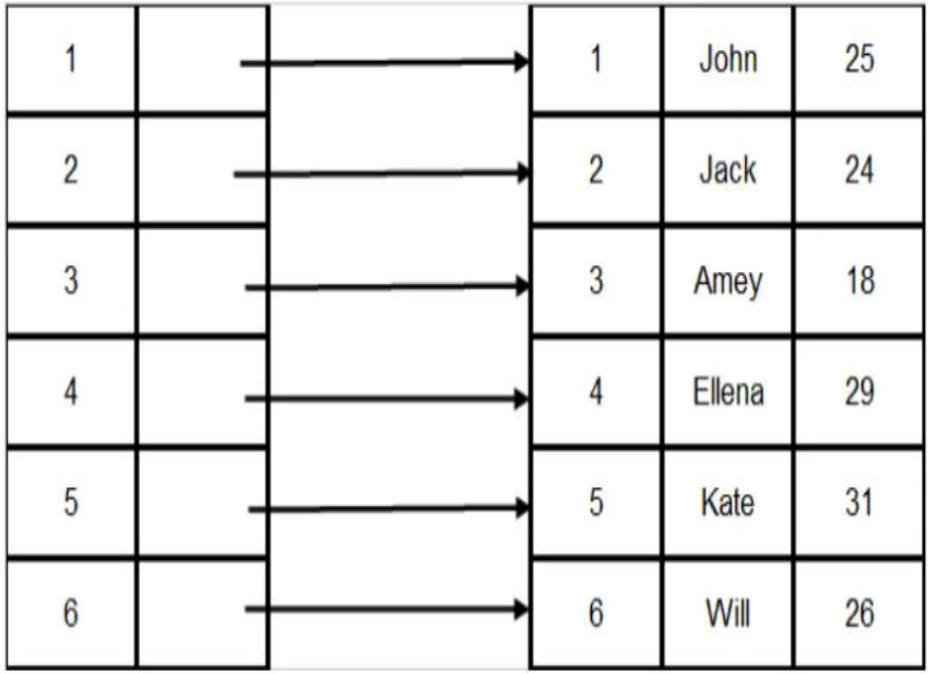
- This **key** is usually an index which is a data structure used to locate data.
- **E.G.,** an index could be based on an **ID** column in a database table.
- This technique/data structure offers us a constant access time **O(1)**
- Used in optimizing performance of databases.

Types of Indexing:

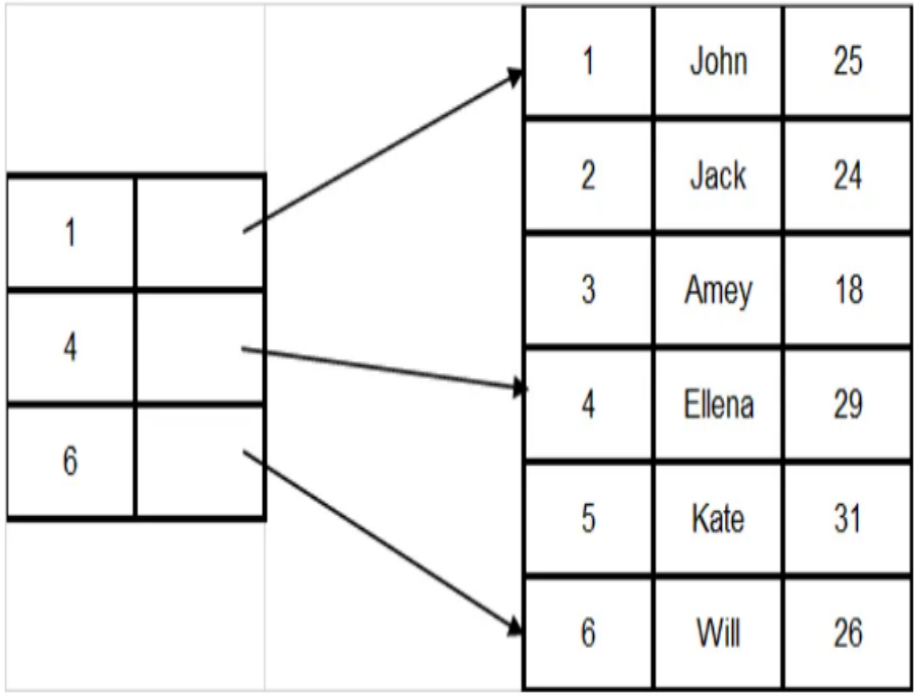
- **Primary Index:** Ordered column with two fields: index and a pointer to the data.
- **Secondary Index:** A two-level mapping technique to reduce the mapping size of 1st-level
- **Clustering Index:** An indexing technique used where multiple instance share a key

Primary Index

Dense Index

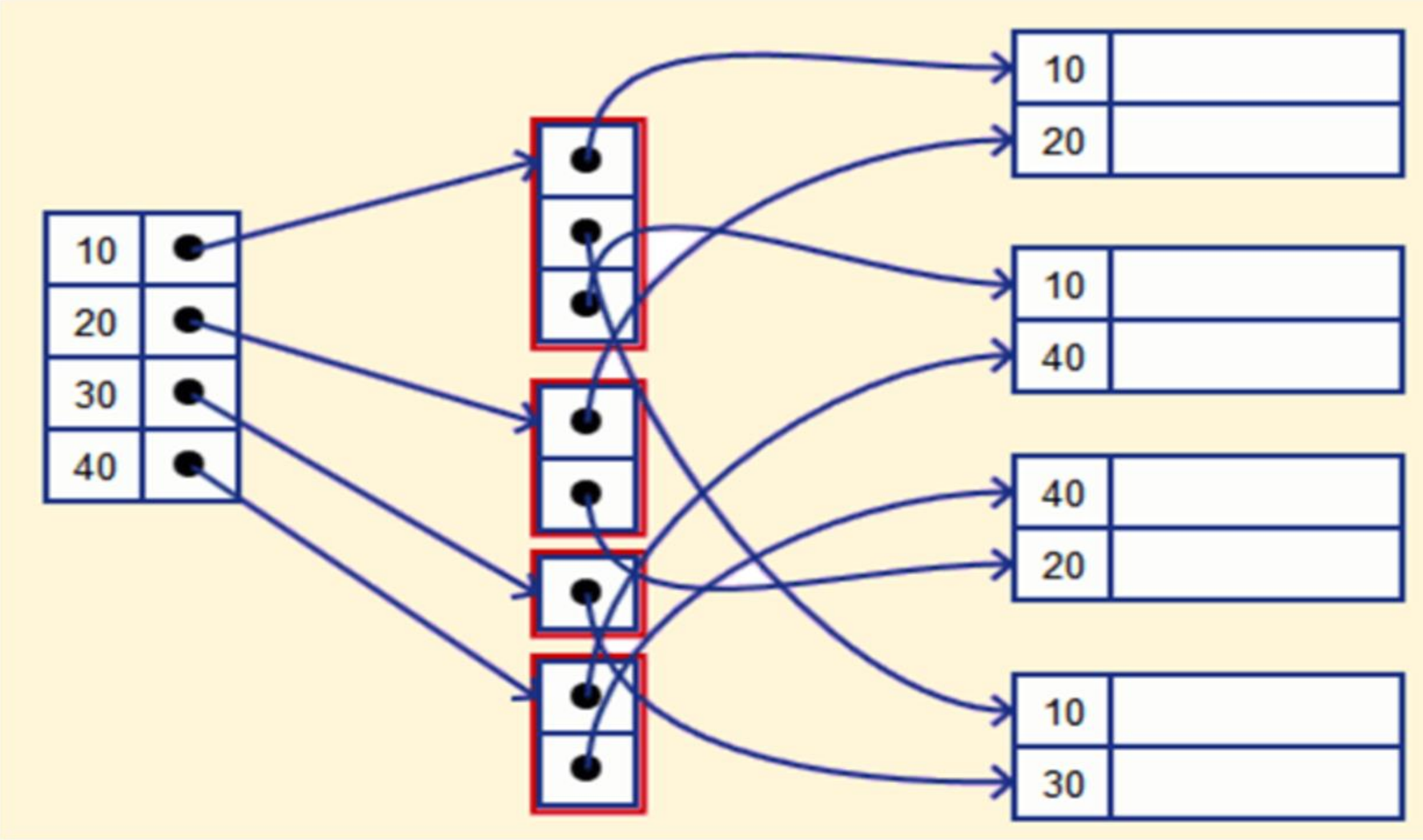


Sparse Index



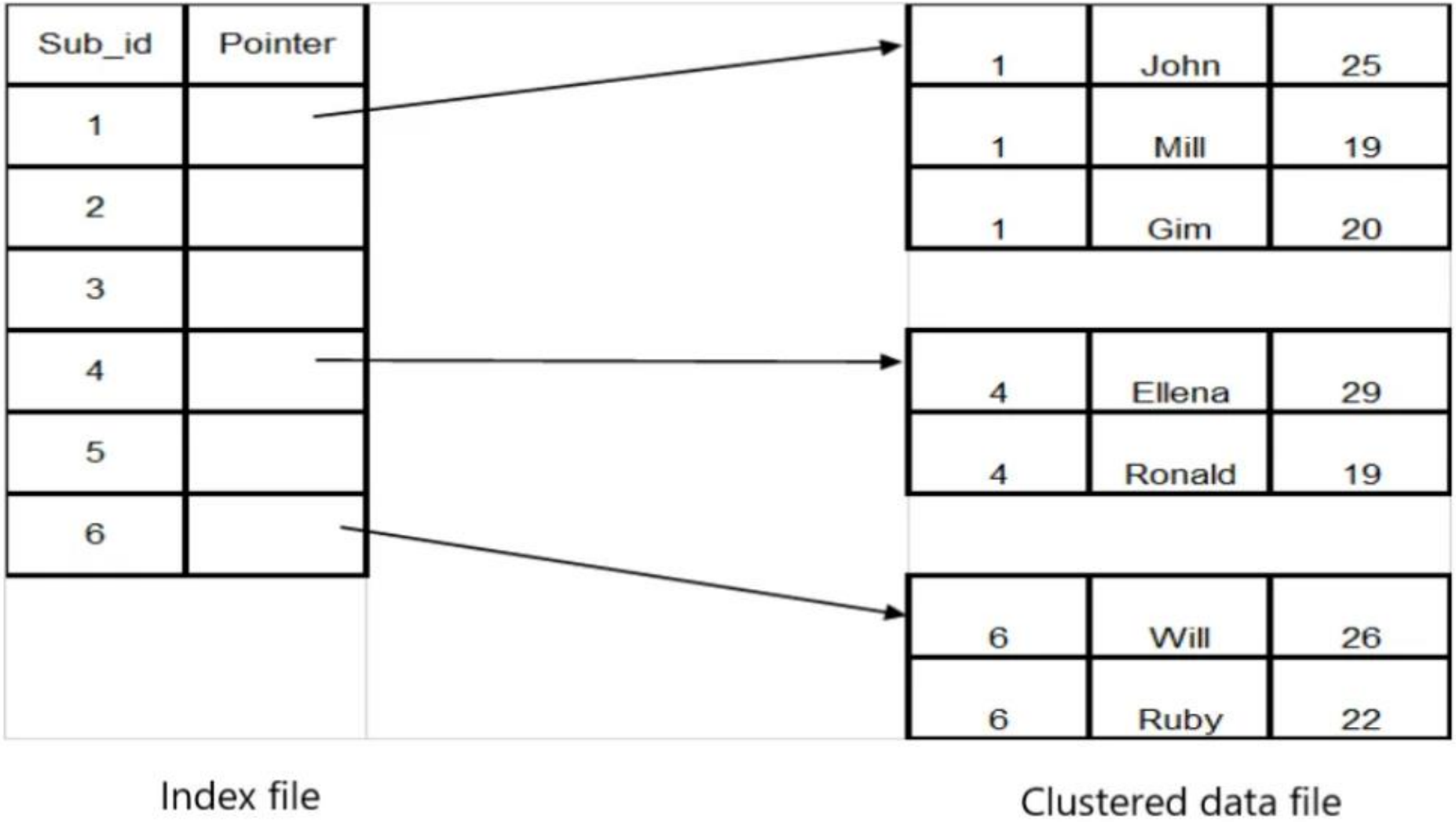
Source: https://medium.com/nerd-for-tech/indexing-data-structures-aa7363693c40

Secondary Index



Source: https://www.guru99.com/indexing-in-database.html

Clustered Index



Source: https://medium.com/nerd-for-tech/indexing-data-structures-aa7363693c40

Hashing

Hashing: A technique used to search the location of data instance without using an index.

Hash Function: A key-value mapping function that maps a hashed key to value.

- Based on a attribute of given data, we can generate special keys
- This can introduce duplicate keys, how to fix this issue?
  - **Probing:** A chain-hash function used to find the next available position
  - **Sequential Linked-list:** At a position there could exist a linked list for the duplicates.

Types of Probing: Linear Probing, Stepped Probing, Pseudo-Random Probing, and Quadratic Probing

Data Structures: Hash Table, Hash Maps, Dictionaries…etc.

THANK YOU